DATA LOGGING AND TRANSFER SYSTEM USING PORTABLE AND RESIDENT UNITS

CROSS-REFERENCE TO RELATED APPLICATIONS

This invention is related to the subject matter of U. S. Pat. Nos. 4,305,059; 4,341,951 and 4,454,414, all assigned to the assignee of this invention.

TECHNICAL FIELD

The present invention relates generally to electronic data transfer, and more particularly, toward a data transfer system applicable in funds transfer and numerous other environments, comprising a number of portable modules operative selectively in user identification and data accumulation modes. The portable modules communicate with each other directly or communicate with each other by telephone via microprocessor controlled resident units located at points of transaction.

BACKGROUND ART

Spurred by the pressures of paper-based checking which is costly and time consuming for financial institutions and further in light of the inconvenience of maintaining accurate accounting in cash transactions, institutions have sought out and experimented with various electronic means of extending and speeding up account accessibility. To this end and to improve record keeping as well as to reduce flow of actual cash, computer technology has been applied to develop electronic funds transfer, which is essentially a process of value exchange achieved through electronic devices. Examples of electronic funds transfer equipment that have become used on a substantial basis in recent years are the Automated Clearning House (ACH), the Automated Teller Machine (ATM) and the point of sale system (POS).

To eliminate the presence of a central computer in every transaction, there has been a trend toward off-line electronic funds transfer, that is, transfer of data between portable and resident units, with only periodic downloading of data to the central computer. In Mareno U.S. Pat. No. 4,007,355, for example, cashless transactions are made between credit cards through a special interface located at each vendor station. Stuckert U.S. Pat. No. 4,277,837 is directed toward a cashless, off-line transaction system involving portable units that are carried by customers and adapted for use with data storage and transfer cards.

The Moreno and Stuckert systems have particular problems that have limited their widespread use in off-line electronic funds transfer. In Marino, no exchange of funds may be made arbitrarily because the cards carried by each user, although having funds data storage capability, have no keyboards and require a special interface apparatus to be present at each transaction. In Stuckert, cards used with the portable terminals have no display; a separate portable terminal must be involved during each transaction. The user cannot continuously monitor his account, limiting the versatility of the system.

These problems and others were solved by Benton in U.S. Pat. No. 4,305,059 issued on Dec. 8, 1981, disclosing a modular funds transfer system wherein each user as well as vendor carries an identical portable module having a keyboard and a display. Funds are transferred between modules using a hard wire interface, and the account status stored in each module is updated following each transaction. In another patent to Benton Pat. No. 4,341,951, printed vouchers are issued by the portable module following each transaction.

The Benton approach was further refined in U.S. Pat. No. 4,454,414 to provide bidirectional optical coupling between portable funds data transfer modules, including a "hand-shaking" protocol that enables funds transfer to be completed only if a number of criteria are satisfied. These criteria include an identification check following keyboard entry by the user of a secret number and examination of the transaction amount to ensure that it falls within credit limits.

The principles developed by Benton have in the past been limited primarily to electronic funds transfer. There now exists a need, however, to build on these principles to develop a system which, in addition to providing authorization to complete a funds transfer, maintains transaction records as a function of time as well as of amount and type of each transaction. There is likewise a need to further extend and build upon these principles to apply off-line data transfer to applications other than funds transfer, such as monitoring and recording as a function of time: radiation dosage, access within a secured area, physiological data and work-time records. There is further a need to enable direct transfer of data between users off-line directly or between users over the telephone lines or transfer of data on-line between each user and a central computer.

DISCLOSURE OF INVENTION

One object of the invention is to provide a new and improved user identification and account verification system.

Another object is to provide a new and improved, modular, user identifcation and account verification system.

Another object of the invention is to provide an off-line data transfer system that is operative selectively in user identification and data accumulation modes.

Another object is to provide an off-line data transfer system using portable modules that accumulate and communicate data as well as resident units which receive data from the portable modules for on-line communication to a central computer.

Another object is to provide an off-line, modular, funds transfer system which is periodically placed on line for data verification from a central computer and is automatically disabled by the computer in response to a bad account or other factor such as a stolen module.

Another object is to provide off-line data accumulation in applications such as work-time record keeping, physiological data monitoring and radiation dosage monitoring using portable modules that are adapted to accumulate off-line data to be unloaded on-line to a central computer.

Another object is to provide a new and improved user identification and account verification system using optical coupling to transfer information off-line directly between portable modules, off-line between portable modules via resident modules and on-line between portable modules and a central computer via resident modules.

Another object is to provide account verification using portable modules operable selectively in debit and credit modes.

Another object is to provide, in an off-line user identification and account verification system using portable